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JOURNAL OF PHOTOGRAPHY.

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AMERICAN
JOURNAL OF PHOTOGRAPHY
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ACTINISM.

The branch of science which considers the chemical changes produced by the action of light—named many years ago by Herschel, actino-chemistry—has been so developed within recent years, that it has won its way to recognition as a most important, as well as interesting field of investigation. But, apart from its intrinsic interest, there seems to be an especial appropriateness in its consideration at this time, and in this place. Electrical illumination has converted night into day upon your streets, has rendered your shopkeepers independent of sunlight; and it promises, also, by reason of its richness in those very rays that effect chemical changes, to render those who employ the actinic power of light equally independent of the variable and uncertain light of the sun.

Our treatment of the subject this evening must necessarily be controlled by the limited time at our disposal, and it has seemed to me that the most may be accomplished by adopting as a general plan, as indicated in the syllabus, first, a rapid survey of the leading facts, as they present themselves in the development of the science and the illustration of these by typical experiments, and then a consideration of these, as far as possible, in their connection, as explained by the wave theory of light. Uniform treatment of the subject is almost as necessarily excluded as exhaustive treatment, and it will be found necessary to pass by features of the highest interest, and possibly of even greater importance than those presented without even an allusion. Again, whilst photographic processes and manipulations, as such, do not constitute the subject for our consideration, we will find it convenient, and even necessary, at times to employ the terms and processes of photography; but we will do so only in so far as they may assist in the discussion of those general facts and principles that constitute the scientific basis of all photographic practice.

The fact that a pure white compound of silver, called by the alchemists horn silver, by us silver chloride, darkens in the light, was the first observed chemical effect of light, and occupies, in this connection, the same place that the attractive power imparted to amber by friction occupies in the history of electrical science.

I have here, in a protected roll, a piece of paper, coated with a thin layer of the substance. I unroll it, as you see, in the mellow light of these incandescent lamps, without any precaution whatever. That light, comfortable as it is to the eye, is comparatively feeble in its effect upon silver chloride. But Mr. Knapp will expose it for a short time to the light of our arc lamp, and that any effect produced may be more readily noticed, I will first cover it with this cardboard with a design cut out of it, so that a portion of the paper will be completely protected, whilst the other portion will receive the full effect of the light, and we may thus have the advantage of the contrast. In giving this fact the prominence I do, as the first observed in this connection, I do

not, of course, ignore the general observation of the effect of light upon animal and vegetable life. That forced itself upon the attention of man in all ages. The necessity of light for healthy animal and vegetable growth, for the production of color in the flower and bloom upon the fruit, of course could not be overlooked. But in all these cases the action of light is so complicated with so-called vital processes, controlled by so-called vital force, that there is scarcely a hint at its action *per se*. The darkening of this compound, noticed as well by miners in an ore of silver as by the alchemists in the laboratory preparation, was unique, in that it was entirely uncomplicated with mysterious vital processes, in that it was purely a laboratory experiment that invited investigation by ordinary methods.

You notice now, as I uncover this paper, returned to me after exposure, as you have seen, to the light of the arc lamp, how the unprotected portion, represented by the design cut out of the cardboard has been desidedly darkened. This has been accomplished in less than a minute. Any one conversant with photographic practice will understand what that means, and will be surprised at the wonderful actinic power of this arc lamp. For this substance darkens but slowly in diffused sunlight. Now, just as the isolated observed fact in electricity awaited Gilbert to expand it into a branch of science, so this fact waited, until, about a century ago, Scheele, the eminent Swedish chemist, undertook its systematic investigation, and did for actino-chemistry what Gilbert had done for electricity. He explained the change effected by light, *practically*, as we understand it to-day, as a separation of chlorine. But he did more. The query arose in his mind whether all the rays of sunlight were equally effective. He investigated the problem experimentally. Availing himself of the beautiful discovery of Newton, he threw, by means of a prism, the parti-colored band of light called the spectrum upon the floor of the room, and in it placed powdered silvered chloride. He found the effect greatest at the blue end. We have not sunlight at our disposal to repeat the experiment as he did, but we will avail ourselves of our arc light, which we have already tested as to its actinic power. The beautiful spectrum you now see upon the screen is similar to his. In it we will now test the actinism of the extrime ends—the blue and the red portions. We will employ an ordinary photographic glass plate, sensitive to light, so that the result can be exhibited by the lantern upon the screen. But first, in this case, all our incandescent lamps must be turned off. The reason for this will be apparent as we proceed. Now, as you see, one end of the plate is exposed behind one half of the stereoscopic negative in the red end of the spectrum, and now the other half is held in the same way in the blue end of the spectrum. The exposure in each case has not exceeded thirty seconds. I now pass our plate to be developed, with the request that the developed plate be exhibited to us, in time, by means of the lantern upon the screen. Whilst we await the result I will consider some very natural queries that may have arisen. Why is this experiment conducted so differently from that of a moment ago? Why are the results not exhibited at once, as then? What is implied in this connection in the word "developed?" I would simply say, first, that not the slightest trace of the action of light would have been visible upon the plate just exposed, upon either end, even upon the closest and most careful examination. But, secondly, in response to proper chemical tests, called developers, an invisible effect, sometimes called a latent effect, or image, will become visible, that is, of course, if it has been produced.

It is the possibility of the production of such an invisible latent, but developable effect of the action of light that constitutes the grand discovery of Daguerre, a discovery that may well be regarded as the initial fact of modern photography, and one that renders Daguerre the central figure around which the facts in photographic history most

naturally group themselves. In this statement I have no disposition to deny or detract from the merits of other investigators in this direction. After Scheele almost every chemist and physicist of eminence had experimented to some extent with compounds sensitive to light. Among them Davy, Wedgewood, Wollaston, Herschel, Niepce, Talbot and many others, whose names we cannot even take time to recall. Many of these, or most of them indeed, worked much more scientifically than Daguerre; many of them had a great measure of success in some directions; but all efforts to fix an impression of the image formed in the camera obscura upon a sensitive surface were practically failures up to the time of Daguerre's discovery. It may, therefore, be allowable to give a more detailed account of it, in order to emphasize its historic prominence.

Daguerre was a scene painter in Paris, and an artist of considerable merit, and highly successful in his profession. About 1824 he was first seized with the infatuation to fix permanently the evanescent pictures of the camera, which he employed to assist him in his profession. Nothing already accomplished in that direction seems to have incited him, or encouraged him. How much he even knew of what had been done cannot be accurately stated, but this much can, I think, be said with certainty, that nothing already accomplished indicated in the remotest degree the possibility of discovery in the direction finally taken by him.

But now I am notified that our exposed plate is ready to be exhibited upon the screen, and we will have the opportunity to compare the effects of the red and blue ends of the spectrum upon it. We see in the picture upon the screen that there has been an impression upon that end of the plate. I do not recognize the picture, but what it may be matters not, it is the fact that an impression has been produced, that is the all-important fact for us. The photographic assistant informs us that this is the half exposed in the blue end, and now as he passes the other end into the lantern the blank upon the screen shows the absence of effect by the red rays.

So far our experiment yields results identical with those of Scheele's with silver chloride. But these effects, as I have already stated, were invisible when the plate left us; they have only put in an appearance under a treatment called *development*. And now let us return to the history of the discovery of this developable effect. Some portions of it remind us of those little bits of embellishment often thrown around the history of science, as well as civil history. I would hesitate to give it had I not strongest ground for belief in its authenticity. No alchemist had ever gone to work at a more unpromising task than that Daguerre had imposed upon himself. As years rolled on the passion only took deeper hold upon him. In spite of utter failures and discouragement of all kinds, for years, in loneliness and in secrecy, suspected of mental weakness, even by his wife, he kept on in the same line of experiment. Finally one of those accidents, that only strike men who work their way across their path, brought him most remarkable success. One of his methods, in brief, was to subject polished plates of silver to the vapor of iodine until they became coated with a creamy film of silver iodide, then to expose this surface to the image in the camera; but always without the hoped-for effect. The plates thus exposed were then stowed away in the rubbish closet until the supply was exhausted. They were then taken out, re-polished and re-exposed in the camera with the same discouraging results. Upon one occasion, on removal of the plate from the rubbish closet, he found upon it, to his great surprise, the very image that had fallen upon it in the camera. He proceeded to investigate. He exposed another plate in the camera and placed it in the closet with a similar result. Then exposing one plate after another in the camera, and each time removing from the closet some article before stowing the plate in it, each time he found upon it the same faithful delineation of his camera picture. At last

everything had been removed, and still the exposed plate placed in the closet exhibited the developed image. Some mercury spilled upon the floor of the closet alone remained. The magician was detected. The vapor of mercury developed the invisible or latent image on the exposed iodized plate. For some reason or other, the mercury adhered to the portions acted upon by the light, and in proportion to the action of the light, thus rendering faithfully all the gradation of tones.

The excitement in the scientific world upon the announcement of the success was intense. Capital, however, hesitated to patronise the invention; but Arago, struck with the exquisite beauty of these first Daguerreotypes, and the promises of the discovery, undertook its advocacy, and the French Legislature pensioned Daguerre and his *collaborateur* Niepce, that it might present the invention as a gift to the world. The formal announcement of the process was made before one of the most brilliant assemblages of the French capital. But it may be asked—after all, what was there so important in the discovery of an invisible effect that needed development? The great value lay in the rapidity with which this developable effect could be produced. Hours required before to produce the feeblest visible effect were now reduced to minutes, and even seconds. It was permitted to hope that portraits would become possible. The first successful attempts at photographic portraiture were not, however, made by Daguerre, but by that remarkable man, Dr. John W. Draper, of New York. By his previous careful scientific investigations, he was prepared at once to see the importance of Daguerre's discovery and to utilize it. But these compounds as then produced were comparatively so slow to receive even the latent effect, that the subject was obliged to sit with powdered face in the bright sunshine.

But to return to the spectrum. The recognition of three classes of effects in sunlight is inevitable. Two of these, light and heat, accompanied as they are by corresponding sensations, report themselves to us directly. The existence of the third, without any corresponding sensation, we may regard as first established on a scientific basis by the investigations of Scheele, and he also showed that it was not equally distributed throughout the spectrum. Herschel, in his investigation of the distribution of the heat, found that after the visible spectrum had ceased with the extreme red rays, there were still rays invisible, incapable of affecting the retina, but capable of producing heat, and Professor Langley, recently, with his delicate "bolometer," pushing his investigations still further into this infra-red region of the spectrum, has demonstrated the presence of rays where their presence was hardly suspected before, in fact where extra-polation formula would not allow them to exist. So on the other hand, Ritter, continuing the investigations of Scheele, found equally invisible rays in the ultra-violet portion of the spectrum, capable in the highest degree of prodvcing chemical changes.—*British Journal of Photography.*

The Photographic Society of Philadelphia.

Minutes of the stated meeting, held Wednesday evening, July 1st, 1885, the President, Mr. Joseph W. Bates, in the Chair.

There being no business brought before the meeting, Mr. Wood asked advice in regard to developing a plate which had been exposed on an oil painting in which there was a large proportion of very non-active color, contrasted with a certain amount of strong high light. This sort of subject naturally presented great difficulties for its proper development.

A long exposure was necessary to obtain the detail in the darker parts. The effect of the violent contrast was to be counteracted by keeping down the amount of pyro and bromide, and increasing the ammonia or other alkali, and also by using the developer quite dilute.

This treatment would tend to bring out the detail throughout the picture, and, as far as possible, keep down the strong contrast between different portions of it.

Some interesting instantaneous pictures were sent by Mr. McCollin to show the work of a new exposer, the invention of Mr. Barker, which was soon to be put in the market. The exposure was made through a slit cut in a curtain which passed directly in front of the plate, and the pictures shown were most decided proofs of the efficiency of the shutter and of the rapidity of the Inglis plates, upon which they were taken.

The subjects were those of figures in most rapid motion—running, leaping, bicycle riding, etc., and all were remarkable for their sharpness and full detail. The bicycle pictures represented wonderful feats in that line, such as riding down a flight of stone steps on a bicycle with the back wheel removed; riding over a gutter without back wheel or saddle, and leaping from the ground while riding a single wheel provided only with the pedals.

A shutter was also shown constructed on the plan devised by Dr. Morris J. Lewis. A disc of card-board was arranged to rotate behind the lens with a hole through which the exposure was made. At the centre of this disc was a small pinion into which fitted the teeth of a segment of a larger cog-wheel. Rubber bands attached to this segment imparted to it rapid motion, which, on being transmitted to the disc, was greatly multiplied. Great rapidity could be attained by the shutter with no perceptible jar.

Messrs. Wilson, Hood & Co. submitted for inspection samples of a new style of mount, known as "ragged edge," the edge having the appearance of being roughly torn to shape and size.

Mr. Carbutt showed a number of prints of Yellowstone scenery, from 20 by 24 negatives, made by Mr. F. Jay Haynes, of Fargo, Dakota, which were greatly admired. The negatives were made on Carbutt's special plates, and Mr. Haynes had stated that using one plate from a lot of 36 for trial, 35 had been exposed with the loss of only two, the remaining 33 all producing good negatives.

Interesting pictures were also shown by Messrs. Barrington, Corlies, Wood and others.

Adjourned.

Robt. S. Redfield, Secretary.

Minutes of the regular meeting, held Wednesday evening, August 5th, 1885, the President, Mr. Joseph W. Bates, in the Chair.

The minutes of the last stated meeting having been approved, Mr. Wood showed a device for attaching a camera to a car-window, to use in taking pictures from a train in motion. It consisted of a brass plate, which by means of a flange turned down at one edge and a set-screw underneath could be firmly clamped to the window sill. Two small spikes on the inner side of the flange helped to hold the plate in position, and the camera was screwed on to the plate in the same manner as to the head of a tripod.

Mr. Wood also showed a number of views taken in Camden, showing the devastation caused by the recent cyclone.

Messrs. Wilson, Hood & Co. showed some negatives made on the Eastman negative paper, and a number of prints from paper negatives. The prints were remarkable for their fine detail, and the apparent entire absence af any trace of the grain in the negative paper, it being practically impossible to tell whether they were made from glass or paper negatives.

For use in ordinary plate holders, three pieces of wood about the thickness of the glass plate are provided, on which the paper is held in position by a tin frame, fitting tightly around the edges of the board, which is then placed in the holder as though it was a glass plate.

An exposer of ingenious construction, the invention of Mr. Stiff, was also shown. It was intended to be used for either instantaneous work or time exposures up to about 30 seconds.

The slide of the shutter, instead of having the usual opening, was simply cut across so as to form two rectangular pieces The lower piece covering the front of the lens, and the upper one being supported just above, with its lower edge in contact with the top of the first piece.

A pneumatic release caused the lower piece to fall and uncover the lens, and after an interval determined by the adjustment, the second piece fell, completing the exposure.

The length of the exposure as regulated by an ingenious contrivance, in which a lever or pointer operating over a graduated dial plate, changed the size of an opening in an air-chamber, so that the air under pressure of a rubber cap escaped more or less rapidly, the second shutter falling after a certain quantity of air had escaped.

Adjourned.

Robt. S. Redfield, Secretary.

Photographing the Motions of Birds at the "Zoo."

Mr. Muybridge yesterday examined the plates taken from his cameras on the previous day when, by his "instantaneous" system, he and his assistants photographed half a dozen pigeons in motion. The apparatus was so adjusted as to be capable of making twenty-four successive exposures in half a second. Twenty-four distinct electric currents were connected with as many cameras. The largest number of exposures which Mr. Muybridge succeeded in obtaining from one flight of a pigeon on Wednesday was twelve in half a second. In that time the pigeon made five "round" flaps with its wings, the upward and downward movement together being counted one flap.

"I was surprised by this discovery," Mr. Muybridge said. "I had thought that a pigeon would not make more than about one and a half flaps in half a second. A well-known pigeon fancier, whose opinion on the subject I had asked, said he thought the number of flaps made in a minute would be about fifty. The pigeon in question moved its wings at the rate of six hundred flaps a minute; but that was just after starting from the trap or box. I think the bird's wings do not long continue moving as fast as that.

"Those five flaps were divided into twelve exposures. We want to get at least twelve exposures of one flap, and, with that end in view will try pigeons again in a day or two. It is desirable to get twenty-four exposures of one flap. I think we will be able to demonstrate that a pigeon in soaring can operate every feather of the wing, while the wing, as a whole, is apparently not flapping. We propose to double our battery power and make a series of twenty-four exposures in, at most, one-fifth of a second. If we wish we can make several series like that simultaneonsly. If we can make and break the electric currents fast enough we will try to reduce the time of making such a series to one-eighth or one-tenth of a second."

Yesterday Mr. Muybridge experimented with a crow, a fish hawk, a red tail hawk, a black vulture and an owl. The plates taken of these will not be sufficiently developed for examination until some time to-day. All these birds were tied with a very light cord to prevent their escape. The pigeons had not been tied, as they fly around the "Zoo" at will. The hawk's flight was not entirely satisfactory and only four exposures of it were obtained. The owl's flight was also unsatisfactory, owing to its long confinement and nocturnal nature. Mr. Muybridge said he was well pleased with his experiments with the two hawks, and the vulture's flight gave almost equal satisfaction.

The pigeon photographing, Mr. Muybridge said, corroborated statements that have been made about the comparative slowness of the downward movements of the wing. In moving half way down from the top of the flap, he said, the wing consumed as much time as in making the remainder of the flap. —*Public Ledger.*

THE FAIR MISS SENIOR P. SMITH.

A novel experiment has been successfully performed by the Professor of Chemistry and his assistants at Smith's College, with the co-operation of the eleven accomplished young ladies who form the senior class in physics. As a matter of psychological curiosity it was determined to produce, as nearly as

possible, the portrait of the typical girl of culture. The process employed was based upon Francis Galton's experiments in photography. The camera was arranged and the eleven sitters quickly took their places before it, each one only occupying a second or two. The sitters so posed that their eyes exactly corresponded with two points marked on the camera, so that each face occupies precisely the same position on the negative. The girl with the most regular features was taken first, and in the end there was developed a photograph showing the features common to all the sitters, but exactly resembling none of them. The result obtained was remarkable. The mystery of the camera is undeniably beautiful. With high brow, softened by fluffy waves of hair, deep-eyed, with refined features aud earnest expression, she is a young woman of dignity and sweetness. To be sure, she has a tendency toward a double chin, but the lines of her countenance are noble, and her head is evenly developed. The senior class at Smith's College has named its new sister "Miss Senior P. Smith," the P indicating physics, and will place her mystic photograph in their album among the class photographs of bright and thoroughly alive graduates.—*Boston Post.*

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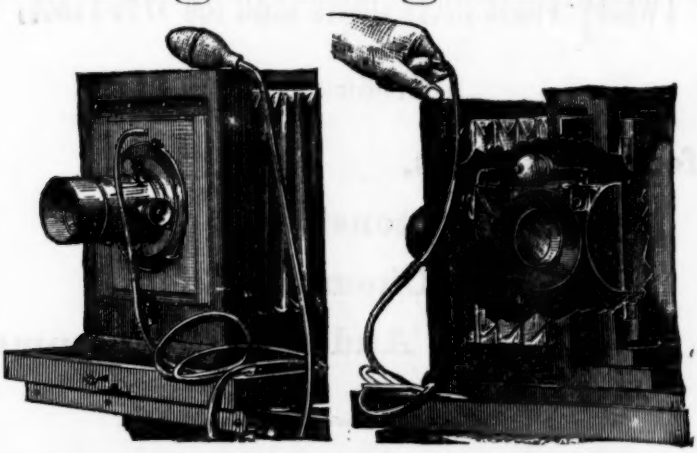

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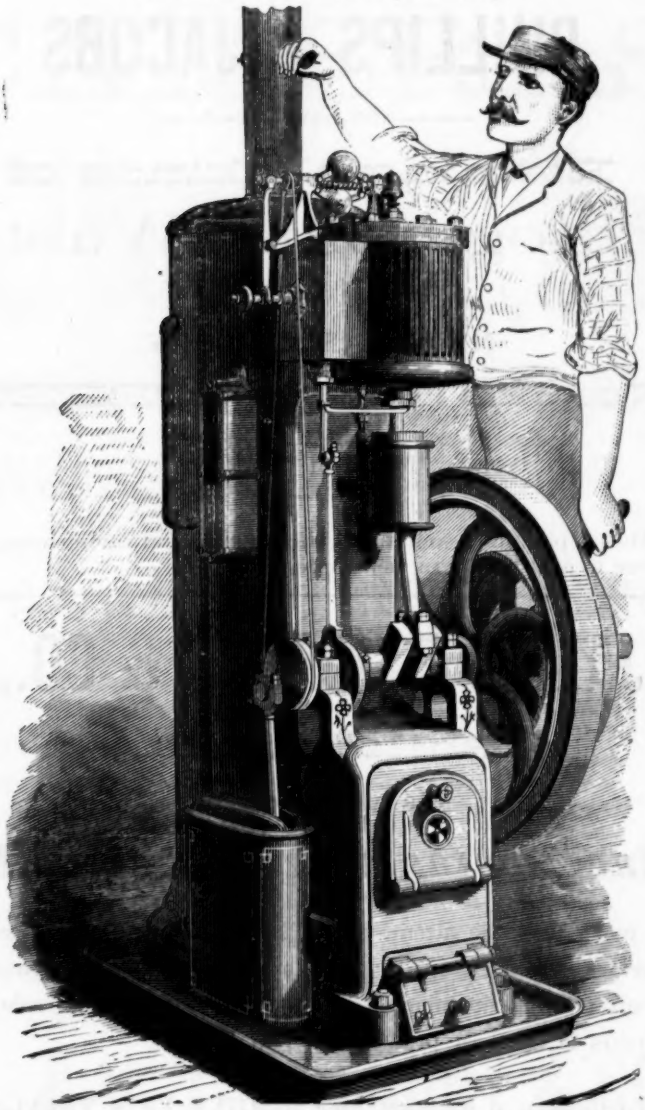

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NOVEL

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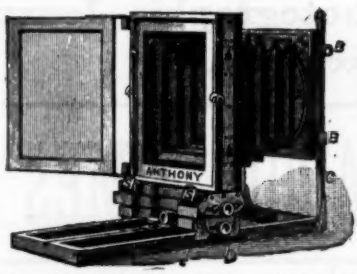
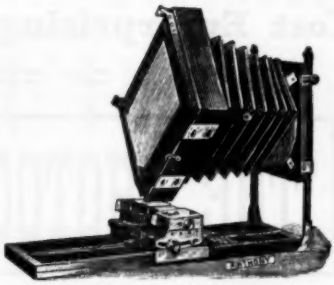


Showing Camera in position for vertical pictures.



Showing Camera being reversed.

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